

DATAMEC[®]

D 3030

*Computer
Magnetic Tape
Units*

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Datamec **D 3030** Computer Magnetic Tape Units operate at 75 inches-per-second tape speed, writing and reading IBM standard computer format tapes at the recording densities of 800, 556, and 200 characters per inch. Data transfer rates are 60,000, 41,700, and 15,000 characters per second.

The **D 3030** product series is designed to provide the computer tape unit equipment best suited for most economical integration into your computer or special data system. Standard production unit configurations include:

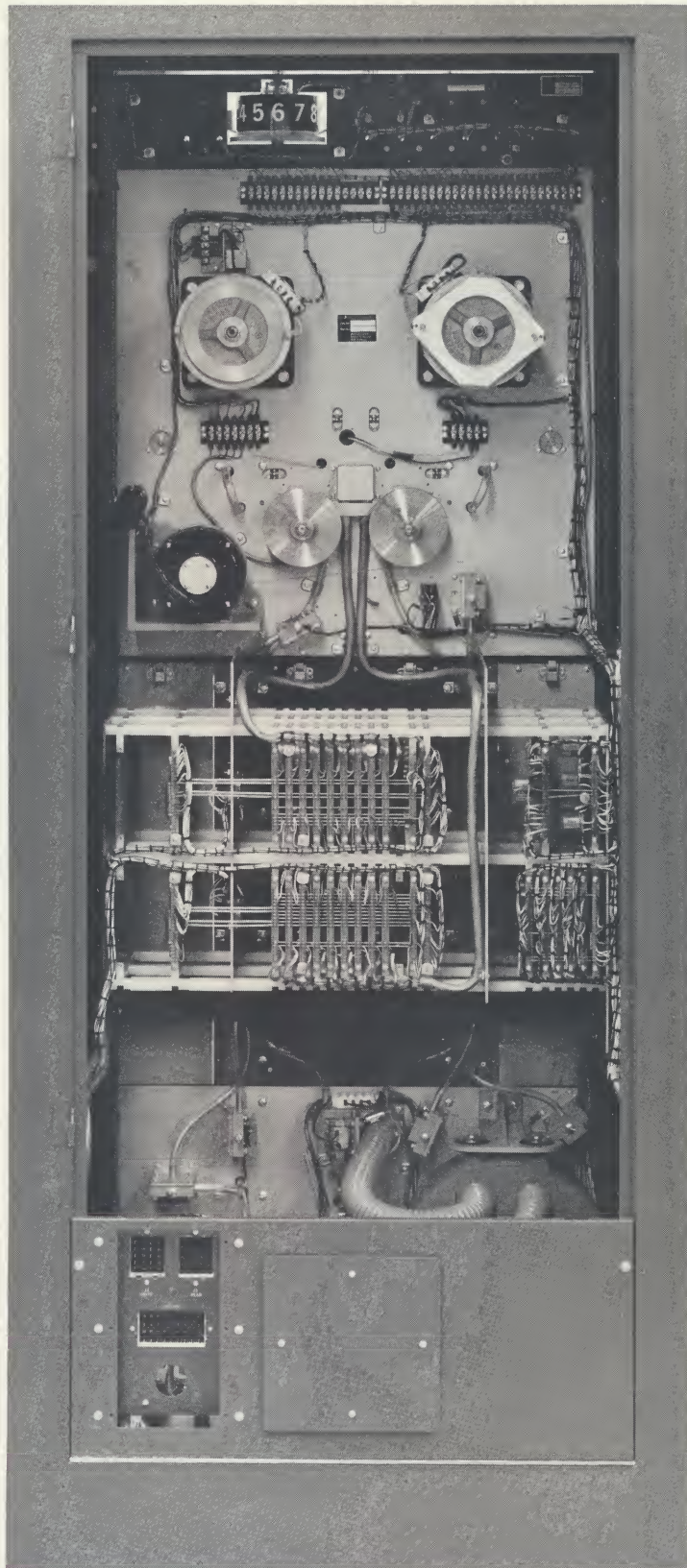
- D 3030 Tape Units
- D 3030 Master Tape Units
- D 3030 Base Units

D 3030 Tape Units are complete with data electronics. The tape units accept data input at logic levels for writing, and supply the reproduced data detected and converted to logic levels, with the data clocked out from an output register.

D 3030 Master Tape Units include, in addition, electronic switching circuitry for the data electronics and the control circuits. Combining a Master Unit with one, two, or three additional Base Units makes a complete Dual-Unit, Triple-Unit, or Quad-Unit magnetic tape system.

D 3030 Base Units are the foundation equipment for **D 3030** Tape Units and **D 3030** Master Units. The Base Units alone are available to manufacturers who prefer to produce the data electronics portion of their computer tape unit systems.

Base Units include the electromechanical tape handling mechanisms; the magnetic heads; control electronics for local operator and remote automatic control; operator controls and indicators; photoreflexive tab sensors, amplifiers, and logic circuitry for Load Point and End of Tape markers; a sensor and Write Lock-Out circuitry for File Protection; fast and slow Rewind circuitry and selection logic; all necessary power supplies and interconnecting cabling. Base Unit components are integrally mounted in a sturdy and attractive cabinet, with provision for internal mounting of data electronics card racks. The front cover door includes a counterbalanced fast access slide panel for rapid tape loading and threading.



Rear View of Tape Unit

The **Operator Controls** are back lighted push button switches to switch control of the tape unit to **auto-matic** (remote) or to **local**; to **select density**; to **rewind** the tape to load point, and to **reverse drive** the tape leader out of the drive mechanism for file removal. Back lighted indicators show **writing enabled** status and **end of tape** warning. The density selected is indicated by the lighting of one of three jewel lights adjacent to the **change density** switch. A prominent, back lighted **unit designator numeral** follows the setting of a drum type switch.

The **tape drive system** uses counter-rotating capstans driven by a synchronous motor. Solenoid type actuators drive positive alignment pinch rollers, assuring precise, fast start-stop characteristics with minimum tape wear and mechanical maintenance.

Vacuum column tape buffers supply tape at low inertia and under constant tension to the tape drive system. Vacuum switches sense the supply of tape in the vacuum chambers and control DC reel torque motors and rugged disk-type reel brakes through a non-linear servo system to maintain the buffer tape supply.

Tape threading is fast, graceful and semi-automatic. The tape path requires a minimum number of rotary guides, with short unsupported tape spans to minimize tape skew and instantaneous speed variations.

All D 3030 units include Beginning of Tape (Load Point) and End of Tape reflective tab **photosensing** heads, amplifiers and logic circuitry for automatically positioning the tape at Load Point on threading and after rewinding, and circuitry furnishing Load Point position and End of Tape warning status signals to the external control equipment. **File protection** is provided by a sensor at the file reel hub and circuitry inhibiting write head current unless a write enable ring is inserted in the file tape reel loaded on the unit.

In **Fast Rewind** the tape is withdrawn from the vacuum chambers and spooled rapidly from the machine reel to the file tape reel. Since the fast rewind initiation requires a few seconds, a photoelectric sensor determines a threshold amount of tape on the machine reel below which rewinding may be accomplished in less time by the 75 ips Reverse Drive. When a rewind command is received, logic circuitry in the unit selects the more efficient rewind method, and completes the rewind with the tape repositioned at Load Point.

The **Tape Handling System Electronics** are packaged on printed circuit cards mounted in a card rack so that the cards are readily accessible from the front of the unit. An extender card for servicing is included.

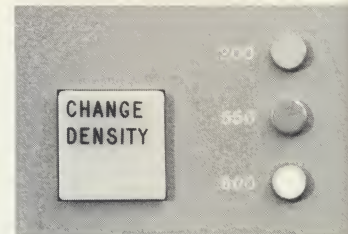
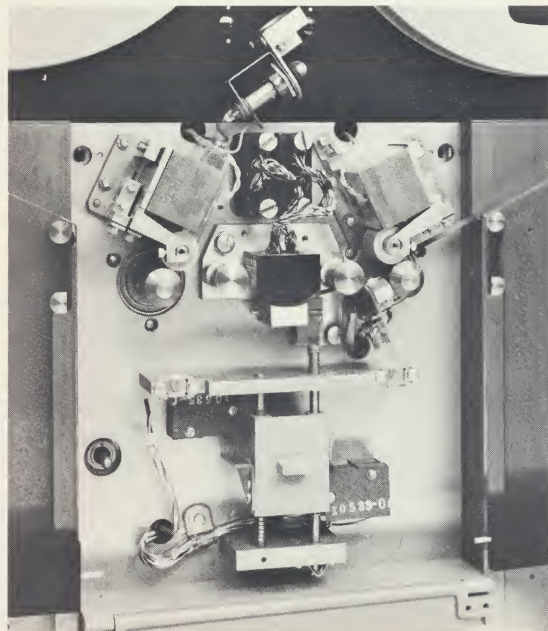
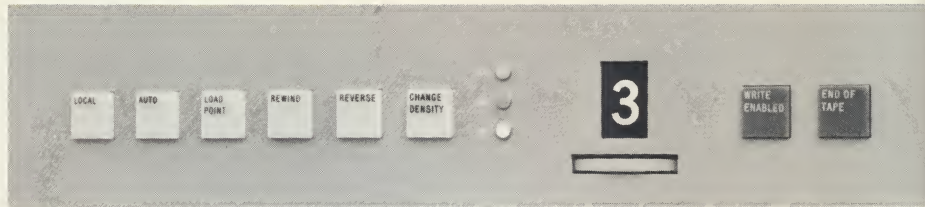
The **Data Electronics** furnished with D 3030 Tape Units and Master Tape Units (not furnished with D 3030 Base Units) are packaged on printed circuit cards. These are mounted in an extension of the same modular card rack that contains the electronics for the tape handling system. All cards are readily accessible from the front of the unit. The extender card for servicing the drive system electronics also may be used for the Data Electronics cards.

All **primary power supplies** are packaged in a sub-chassis mounted at the bottom of the cabinet.

The **cabinetry** combines outstanding operator convenience and maintenance utility with a reserved beauty that complements any data system. The unit mechanisms are mounted on precision plates finished in black to blend with any color scheme. Unless otherwise specified, the rest of the Tape Unit is finished in textured dark and light grey, with an accent color of ochre.

The **slide panel** for tape loading is integral to the **front cover door**, which provides ready access to the tape handling components for routine cleaning. Cover panels over the drive mechanisms and the electronics cards snap out and in easily.

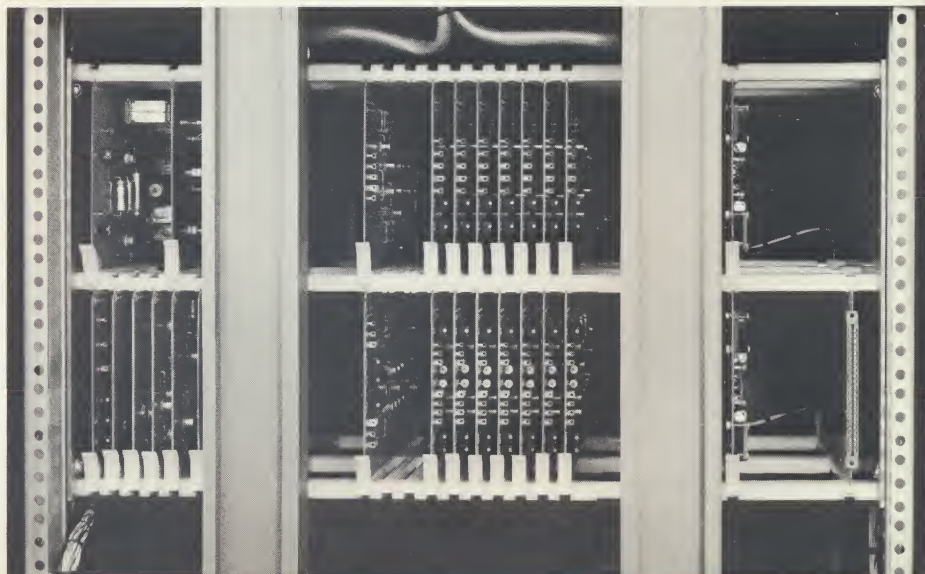
Tape Handling and Data Electronics Cards



Density Select

Tape Drive System

Easy, Fast Tape Threading



*Write-Read Triple Density
Data Electronics*

TYPE OF DATA RECORDING: D 3030 Tape Units use NRZI recording. (Compatible with all IBM 727 and 729 series tape units at 800, 556 or 200 bits per inch recording densities.) In the write mode, current flows through the heads continuously in one direction or the other, magnetizing the tape to saturation. A bit (logical "one") is recorded on the tape by reversing the direction of the head current. In the read mode, the points of flux reversal induce current pulses in the read head; the presence or absence of a pulse during the character period indicates a logical one or zero, respectively.

WRITE DATA ELECTRONICS FUNCTIONS: The D 3030 Write Data Electronics accepts seven channel parallel data at its input in the form of either pulses or logic levels, converts the data to the NRZI form, and drives the seven write heads to record tapes. A Write Reset input permits the external control equipment to switch all head currents to the common direction for writing inter-record and other gaps on the tape, and a Write Permit input provides for external on-off control of head current. (The File Protect system has overriding "off" control of the head current.)

The Write Data Electronics include delay circuits in each channel compensating for static time displacement error ("skew") to assure that the recorded bit alignment on the tapes is within the tolerances required for the higher densities (800 or 556 BPI). The Write Data Electronics also include circuits for driving the erase head when writing is enabled and permitted, and circuitry compensating for any pulse asymmetry characteristics in the individual write heads. These features are required for adequate margin at the 800 BPI recording density.

READ DATA ELECTRONICS FUNCTIONS: The D 3030 Read Data Electronics amplifies the seven read head outputs, detects the recorded one-bits, and strobes the one-bits constituting each character into an output register. The data output consists of seven logic levels at the output register and a clock pulse. A Read Reset input is provided which permits the external control equipment to set the tape unit output registers all to the same state and to inhibit tape unit data output when desired.

The Read Data Electronics includes circuitry which changes the read detection threshold from a normal 20% of full pulse amplitude to 40% whenever writing is occurring, so that incipient data drop-outs may be detected during the Read-While-Writing mode of operation.

The Read Data Electronics include circuitry that detects the one-bits at the time of their pulse peaks, reducing time displacement error that would be caused by pulse

amplitude variations if simpler threshold detection circuitry were used, and include delay circuits in each channel compensating for static time displacement error introduced by the mechanical system ("skew"). Delays for both Forward and Reverse directions of tape travel are included, with circuitry which senses the direction and switches the delays accordingly.

WRITE DATA ELECTRONICS INPUT CHARACTERISTICS: The Write Data Electronics provides seven identical data channel inputs, one clock input, one write reset input, and one write permit input. The input circuits are transistor triggers, 2,200 ohms input impedance. The trigger circuits are designed such that by choice of strapping on the electronics cards during manufacture either positive or negative input signals will be accepted. The triggers are "on" with 9 ± 6 volts (or, when negative strapped, -9 ± 6 volts) at their input and "off" with zero $\pm \frac{1}{2}$ volt at their input.

The logic circuits in the Write Data Electronics are designed such that by choice of strapping during manufacture one of three data input logic types will be accepted: Pulse, Level True, or Level False. Pulse input strapping requires coincident pulses at the seven data inputs for the logical "ones" of each character to be recorded, and no signal at the clock input. Level True input strapping requires a clock pulse input and voltage levels at the seven data inputs; a one-bit is recorded on each of the seven channels for which the data input level is True at the time of the clock pulse. With Level False input strapping a one-bit is recorded on each of the seven channels for which the data input level is zero at the time of the clock pulse.

Please specify Positive Pulse, Negative Pulse, Positive Level True, Positive Level False, Negative Level True, or Negative Level False input characteristics when ordering.

READ DATA ELECTRONICS OUTPUT CHARACTERISTICS: There are seven data outputs and one clock output. The eight output cir-

cuits are transistor line drivers designed such that they may be strapped in manufacture to provide either positive ($+9\frac{1}{2}$ volts) or negative ($-9\frac{1}{2}$ volts) output.

The logic circuits of the Read Data Electronics are designed such that by choice of strapping during manufacture either Level True or Level False output will be furnished. With Level True strapping, the one-bits of the reproduced character are represented by voltage levels at the data outputs at the time of the clock pulse output. With Level False strapping, the one-bits of the reproduced character are represented by zero levels at the data outputs at the time of the clock pulse output.

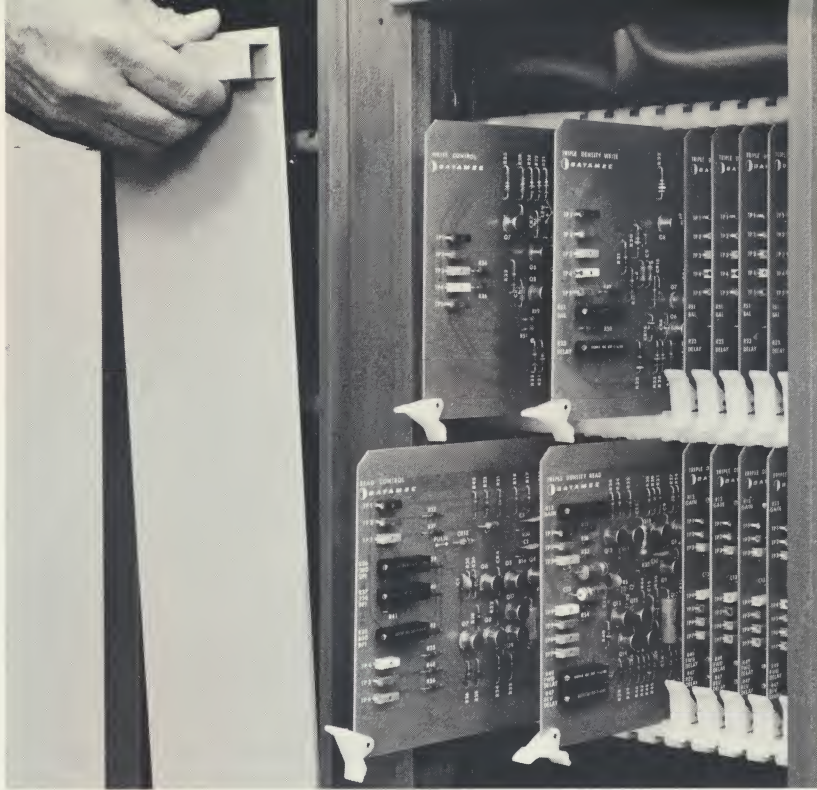
The Read Reset input is a transistor trigger circuit identical to the Write Electronics input circuits which also may be strapped in manufacture for either positive or negative input and for true or false input logic.

Please specify Positive Level True, Positive Level False, Negative Level True or Negative Level False data output characteristics when ordering.

LATERAL PARITY GENERATION AND CHECKING: Lateral Parity generation, Lateral Parity checking, or both are available as standard production options with the D 3030 Data Electronics at small added cost.

When the Lateral Parity Generator card is included with the Write Data Electronics, only six data channel inputs are provided to the external equipment and a "Parity odd/even Select" input is added. The Write Data electronics then generates and records the parity bit on the seventh data track as the six-level data characters are received. The other functions and input characteristics of the Write Data Electronics remain unchanged.

When the Lateral Parity Checking card is included with the Read Data Electronics only six data channel outputs are provided to the external equipment, and both a "Read odd/even Parity Select" input and a "Parity Error" output are added. The other functions and output characteristics of the Read Data Electronics remain unchanged.



D 3030...another great dependable from Datamec

Presenting the handsome new **D 3030** series of computer magnetic tape units. Engineered specially for the major computer market and its medium speed requirements.

Like the famous Datamec **D 2020**, which has set new industry standards for low-cost operation, the new **D 3030** offers unprecedented **economy** and **reliability** for heavy duty, on-line use with digital computers and other digital EDP systems requiring higher data transfer rates. Experience, broadest in the industry, lies behind every design feature of the **D 3030**. That's why the user knows he'll get lowest cost performance plus trouble-free operation, day after day after day.

HIGH TRANSFER RATES

The **D 3030** reads and writes all three density formats (800, 556 and 200 characters per inch) at 75 inches-per-second tape speed. Data transfer rates are 60,000, 41,700 and 15,000 characters per second.

MORE USER CONVENIENCE

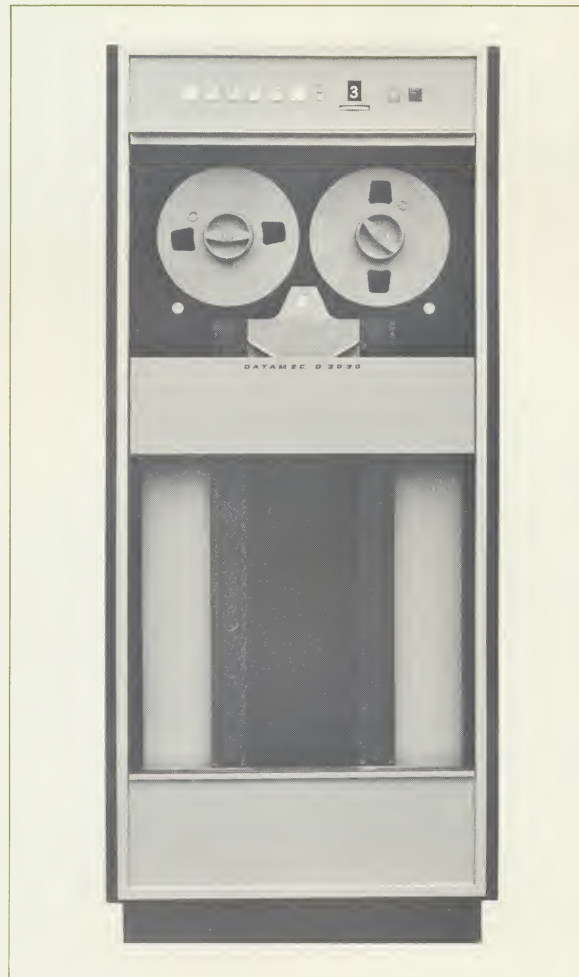
Threading the **D 3030** is fast, effortless and nearly automatic. No special tape leaders needed. The rotary, positive stop, self-seating reel hold down makes loading/unloading unbelievably easy.

REAL BEAUTY OUT FRONT

The **D 3030** enhances the appearance of any computer installation. All eyes are just naturally attracted to the clean, modern, striking lines of this handsome tape unit. Equally good looking around in back, too!

TOTAL ECONOMY

Initial cost of the **D 3030** is lowest in the medium speed class. And maintenance expense, both routine and corrective, shatters old accepted minimums. Freed of service problems, the customer gets **complete satisfaction** in all ways from the **D 3030**.



D 3030 Triple Density Tape Unit

TAPE SPEED	75 ips, forward and reverse
REELS	10½" diameter; ½" tape; IBM type
START TIME	5 ms, bi-directional
STOP TIME	2 ms, bi-directional
REWIND	Less than 3 minutes
TRANSFER RATES	800 cpi: 60,000 cps 556 cpi: 41,700 cps 200 cpi: 15,000 cps

THE PRODUCT SERIES

D 3030 Tape Units and **D 3030** Base Units for writing and reading seven-track IBM format computer tapes are described in this bulletin.

D 3030 Master Tape Units with electronic switchers are described in Datamec Bulletin Form 114.

All products in the **D 3030** series are immediately available using the nine-track, IBM Series 360 tape format. Alternately, the units described in this bulletin may, at small extra cost, include provision for later conversion to the nine-track tape format by exchanging the head assembly and adding plug-in data electronics cards. These model variations are described in Datamec Bulletin Form 115.

D 3030 SPECIFICATIONS

PHYSICAL CHARACTERISTICS

INPUT-OUTPUT TERMINALS: Primary power, tape unit control, data input, and data output connectors are located at the lower rear of the cabinet such that connecting cables from the external equipment may be brought in through the cabinet rear or up from the floor through the cabinet bottom. Mating connectors are furnished.

TAPE MOTION CONTROL INPUTS: The control input circuits are transistor triggers, 2,200 ohms input impedance. The circuits are designed such that by choice of strapping during manufacture either positive or negative input signals will be accepted, and either True or False command logic will be accepted. Command input levels required are 9 ± 6 volts (or, when negative strapped, -9 ± 6 volts) and zero $\pm \frac{1}{2}$ volt.

Please specify Positive True, Positive False, Negative True, or Negative False command input logic when ordering. The four command inputs are:

Forward Drive: Drive is maintained so long as the command input level is maintained.

Reverse Drive: Same characteristics as Forward Drive.

Rewind: A momentary (10 microsecond) level initiates Rewind. Control logic selects slow (75 ips) or fast (reel-to-reel) rewind depending upon the amount of tape on the machine reel. The tape is automatically repositioned to Load Point at the end of the rewind cycle.

Unload: Same command and response characteristics as Rewind, with the additional response that the tape unit is switched to Local and will accept no further commands from the external controller.

TAPE MOTION INTERLOCKS: Simultaneous Forward and Reverse Drive inputs are rejected without damage to the tape or the Tape Unit. Rewind or Unload inputs occurring while the unit is in Forward or Reverse Drive are stored and executed when the drive input is removed. Write and Erase circuits are disabled during Rewind.

STATUS OUTPUTS TO EXTERNAL CONTROL: The Status outputs from the tape unit to the external control equipments consist of voltage levels ($9\frac{1}{2} \pm 1$ volts and zero $\pm \frac{1}{2}$ volt) from transistor line driver circuits. The circuits are designed such that they may be strapped during manufacture to provide either Positive or Negative output levels, and either True or False output logic.

Please specify Positive True, Positive False, Negative True, or Negative False status output when ordering. The six status outputs show:

Ready: Tape is threaded, vacuum is up, tape unit is under Automatic control and ready to accept commands.

Rewind: Tape unit is in Rewind.

Load Point: Tape is positioned at Load Point and tape unit is in Ready status.

Write Enabled: The Write Data Electronics are enabled, and tape unit is in Ready status.

End of Tape: The EOT photoreflexive marker has passed the photosense head since the last Rewind command was received, and tape unit is in Ready status.

Unit Designate: Switch closure. A common and 10 lines representing the numerals 0 through 9 on the address indicator are brought out. The common connects to the line corresponding to the unit designate numeral showing on the control panel.

MAGNETIC HEAD ASSEMBLIES: The Magnetic Head Assembly includes separate 7 track Write and Read head stacks, a full track Erase head, a "head gate" reducing write-to-read head coupling, and vacuum cleaning tape guides precision mounted to a base plate. The assembly may be exchanged without the use of special tools or gauges.

The Write and Read heads are seven track, IBM standard track widths and spacings. The center line of the first track is .040" from the top edge of the tape; succeeding tracks are centered at .070" increments, with a constant tolerance of $\pm .0025$ " for each track center referenced to the top edge of the tape. The Write head track width is .048", the Read head track width .030".

Write-to-Read head gap spacing is $.300" \pm .005"$. The Erase head is mounted so that it is passed first by a point on the tape moving in the forward direction of tape travel.

DIMENSIONS: Over all external dimensions of the Tape Unit cabinet are 29 $\frac{1}{2}$ " wide by 69" high by 25" deep. Units may be installed in side-by-side contact with no separation clearance required for cabinet door opening. A clearance of 28" in front of the cabinet is required for the front cabinet door to be opened a full 90°.

PERFORMANCE CHARACTERISTICS

TAPE MOTION: The following specifications apply to units operating at 75 ips tape speed from a precise 60 cps (or 50 cps) AC line.

Start Characteristics: Within 5 milliseconds after a forward or reverse drive command is initiated the tape speed will be within $\pm 5\%$ of normal speed. The tape travel during the 5 ms start period will be 0.185 ± 0.025 inch.

Stop Characteristics: All tape motion will cease in less than 2 milliseconds after the forward or reverse drive command is removed. No spurious signals will be generated after this time. The tape travel during the 2 ms stop period will be $0.080 + 0.010 - 0.015$ inch.

Run Characteristics: Average long term speed deviation will be less than $\pm 1\%$. Speed deviation from average will be less than $\pm 1\%$ when measured over tape lengths as short as 1.5 inches, and less than $\pm 1\frac{1}{2}\%$ when measured over tape lengths as short as 0.135 inches.

Rewind Time: A full 2,400 foot reel of tape will be rewound within three minutes after the initiation of a rewind command.

Actuator Characteristics: The tape drive actuation system will accept any sequence of commands without damage to the tape unit or to the tape. Five milliseconds minimum must be allowed between sequential commands (Forward, Stop, Reverse, Stop, etc.) to maintain the specified start and stop distances. More frequent commands may be programmed in sequences where the start or stop distances are not critical.

SKREW: Pulses written simultaneously on two or more channels may be displaced in time when reproduced due to imperfections in the mechanical tape handling system. This time displacement is termed "Skew," and specified as the worst case time displacement of the reproduced pulse from any channel when referenced to the pulse from any other channel.

"Static Skew" is measured as the observed constant component of the total channel-to-channel time displacement, and "Dynamic Skew" the varying component.

The maximum Dynamic Skew of 3.6 microseconds defines a time band within which the reproduced pulse from any channel will occur when referenced to the reproduced pulse from any other channel.

The maximum Static Skew of 6.0 microseconds states the maximum time displacement from the reference channel pulse of the Dynamic Skew band center. Static Skew is eliminated by compensation circuits in both the Write and Read Data Electronics furnished with D 3030 tape units and master tape units. The Static Skew specification applies when measured without compensation. The maximum Total Skew is the Static Skew plus one-half the Dynamic Skew, 7.8 microseconds when measured without compensation.

The skew specifications apply when tapes are written on any machine and read on any other (or the same) machine. Skew in the Write process alone or the Read process alone is held to within one-half the combined Write-Read specifications quoted.

SYSTEM RELIABILITY: System reliability includes both data reliability, in terms of drop-outs or false injected signals due to tape or Signal Electronics defects, and equipment reliability in terms of mean time to failure and preventive maintenance requirements. All figures pertaining to tape life are for recordings made at a density of 200 bits per inch on 1.5 mil mylar based hard oxide tape of a recognized computer brand and quality.

Write Errors: Write errors, detected in a read-after-write mode, with the signal electronics threshold set at 40%, shall not exceed 30 per reel of tape.

Read Errors—Long Passes: Not more than one permanent error per 150 reels of tape, with the signal electronics detection threshold set at 20%, reading tapes that have no read-after-write errors. A permanent error is one that cannot be cleared after five rereads or by cleaning the read head surface.

Read Errors—Short Passes: Not more than one permanent error per 10,000 passes of a ten foot length of tape, with the signal electronics set for a 20% threshold, and reading a section of tape that does not have any initial errors as detected in a read-after-write check.

ENVIRONMENT:

Input Power: 117 VAC, single phase. The Tape Unit with Data Electronics requires 600 watts standby, 750 watts average operating, 970 watts peak (maximum). The equipment will meet all specifications when operated on line voltages between 105 and 126 VAC, at line frequencies between 58 and 62 cps; or, for 50 cycle models, line frequencies between 48 and 52 cps. (Note that speed variation specifications apply only under conditions of precise power line frequency.)

Temperature: The equipment will operate in ambient temperature between 32° F. and 110° F. Supplemental cooling may be supplied to increase the maximum operable ambient temperature.

Humidity: The equipment will operate at any relative humidity between 20% and 95%.

Altitude: The equipment will operate at any altitude between sea level and 10,000 feet.



DATA MEC®